AD-A192 148 NONLINEAR WAVES(U) CLARKSON UNIV POTSDAM NY DEPT OF MATHEMATICS AND COMPUTER SCIENCE M J ABLOWITZ ET AL. FEB 88 N00014-86-K-0603 1/1

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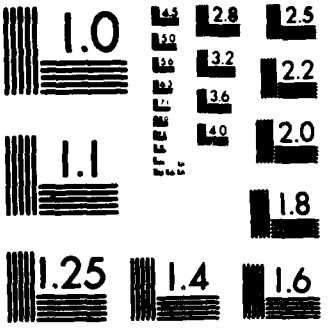


MICROCOPY RESOLUTION TEST CHART
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# FINAL REPORT ON NONLINEAR WAVES

OFFICE OF NAVAL RESEARCH GRANT #N00014-86-K-0603

BY

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The central theme involved in this work is the continuing study of certain fundamental features associated with the nonlinear wave propagation arising in and motivated by physical problems. The usefulness of the work is attested to by the varied applications, and wide areas of interest in physics, engineering and mathematics. The work accomplished in our overall program of study involves wave propagation in a number of areas including fluid mechanics, plasma physics, theoretical physics statistical mechanics, nonlinear optics, multidimensional solitons, multidimensional inverse problems, Painleve equations, direct linearizations of certain nonlinear wave equations, DBAR problems, Riemann-Hilbert boundary value problems, algebraic methods and symmetry analysis of multidimensional systems, differential geometry, etc. Of particular interest to the Navy is (a) the recent discovery that many of the equations describing ship hydrodynamics in channels of finite depth obey nonlinear equations which have been studied extensively by our group. (b) Recent applications of solitons in nonlinear optics and nonlinear soliton type equations arising in the study of digital communications.


(1) Research Objectives

The continuing aspects of the work performed under this grant has been the study of the nonlinear wave phenomena associated with physically significant systems. As mentioned above, this work has important applications in fluid dynamics (e.g. long waves in stratified fluids, solitons generated by ships), nonlinear optics (e.g. self-induced transparency, and self-focussing of light), digital communications via solitons, inverse scattering in one and

higher dimensions. Individuals working with us and hence partially associated with this grant include: Dr. Peter Clarkson, Postdoctoral Research Associate in Mathematics and Computer Science, Dr. Daniel Bar Yaacov, Postdoctoral Research Associate in Mathematics and Computer Science, Mr. Ugurhan Mugan, a graduate student in Mathematics and Computer Science, Mr. Vassilis Papageorgiou, a graduate student in Mathematics and Computer Science, Mr. Rogelio Balart, a graduate student in Mathematics and Computer Science and Ms. Elizabeth Ryan, a graduate student in Mathematics and Computer Science. Recent publications supported by this research grant are enclosed.

Areas of Study Include:

Solutions of nonlinear multidimensional systems arising in Physics.

Inverse problems, especially in multidimensions and DBAR methodology.

Riemann-Hilbert boundary value problems and inverse problems.

Solitons in multidimensional systems, solitons generated by ships in narrow channels.

Nonlinear systems with external focussing.

Semi infinite boundary value problems.

IST for nonlinear singular integro-differential equations;

the Benjamin-Ono equation, the intermediate Long Wave Equation, the Sine-Hilbert equation, multidimensional generalizations.

Discrete IST and numerical simulations.

Painleve equations.

Focussing singularities in nonlinear wave propagation.

Applications to surface waves, internal waves,

shear flows,

nonlinear optics, S.I.T., relativity etc.

Direct linearizing methods for nonlinear

evolution equations.

Multidimensional generalizations of the Sine-

Gordon and wave equations arising in differential

geometry.

Algebraic methods and symmetries of multidimensional

nonlinear evolution equations.

Solutions to semiperiodic multidimensional equations.

PUBLICATIONS

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